

## WHAT IS CLAIMED IS:

1. A method of removing a selected metal-ion from a solution,  
5 comprising the steps of;
  - a. providing a container for holding a liquid, said container having an internal surface having a metal-ion sequestering agent provided on at least a portion of said internal surface for removing a designated metal-ions from said liquid;
  - 10 b. filling said container with said liquid in an open environment;
  - c. closing said container with said liquid contained therein; and
  - d. shipping said container for use of said liquid without any  
15 further processing of said container containing said liquid.
2. A method according to claim 1 wherein said container is positioned such that said metal-ion sequestering agent contacts said liquid for a time period sufficient for removing said designated metal-ions.  
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3. A method according to claim 2 wherein said container comprises a bottle and cap assembly.
4. A method according to claim 3 wherein said bottle is made  
25 of a plastic material.
5. A method according to claim 3 wherein said metal-ion sequestering agent is provided on the internal surface of said bottle.
- 30 6. A method according to claim 3 wherein said bottle is made of a material that includes said metal-ion sequestering agent.

7. A method according to claim 1 wherein said metal-ion sequestering agent is provided on the internal surface of said cap.

8. A method according to claim 1 wherein said liquid has a pH  
5 equal to or greater than about 3.

9. A method according to claim 1 wherein said liquid has a pH equal to or greater than about 4.

10. A fluid container according to claim 1 wherein said metal-ion sequestering agent is immobilized on the surface(s) of said container and has a stability constant greater than  $10^{10}$  with iron (III).

11. A fluid container according to claim 1 wherein said  
15 sequestering agent is immobilized on the surface(s) of said container and has a high-affinity for biologically important metal-ions such as Mn, Zn, Cu and Fe.

12. A fluid container according to claim 1 wherein said  
20 sequestering agent is immobilized on the surface(s) of said container and has a high-selectivity for biologically important metal-ions such as Mn, Zn, Cu and Fe.

13. A fluid container according to claim 1 wherein said  
25 sequestering agent has a high-selectivity for certain metal-ions but a low-affinity for at least one other ion.

14. A fluid container according to claim 13 wherein said certain metal-ions comprises Mn, Zn, Cu and Fe and said other at least one ion comprises calcium.

15. A fluid container according to claim 1 wherein said metal-ion sequestering agent is immobilized on the surface(s) of said container and has a stability constant greater than  $10^{20}$  with iron (III).

16. A fluid container according to claim 1 wherein said metal-ion sequestering agent is immobilized on the surface(s) of said container and has a stability constant greater than  $10^{30}$  with iron (III).

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17. A fluid container according to claim 1 wherein said metal-ion sequestering agent comprises derivatized nanoparticles comprising inorganic nanoparticles having an attached metal-ion sequestrant, wherein said inorganic nanoparticles have an average particle size of less than 200 nm and the derivatized nanoparticles have a stability constant greater than  $10^{10}$  with iron (III).

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18. A fluid container according to claim 1 wherein said metal-ion sequestering agent is immobilized in a polymeric layer, and the polymeric layer contacts the fluid contained therein.

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19. A method for bottling a liquid having a pH equal to or greater than about 2.5, comprising the steps of:

a. providing a container having a metal-ion sequestering agent provided on at least a portion of said internal surface for inhibiting growth of microbes;

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b. filling said container with a liquid having a pH equal to or greater than about 2.5;

c. closing said container with said liquid contained therein; and

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d. shipping said container for use without any further sterilization of said liquid and/or container.

20. A method according to claim 19 wherein said container comprises a bottle and cap.

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21. A method according to claim 19 wherein metal-ion sequestering agent is provided on the interior surface of said bottle.

22. A method according to claim 19 wherein metal-ion sequestering agent is provided on the interior surface of said cap.

5                   23. A method according to claim 19 wherein said bottle is made of a material that includes said metal-ion sequestering agent.

24. A method according to claim 19 wherein said liquid is a beverage that is consumed by individuals.

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25. A method according to claim 19 wherein said pH is equal to or greater than 3.0.

26. A method according to claim 19 wherein said pH is equal to  
15 or greater than 4.0.

27. An article for inhibiting the growth of microbes in a liquid nutrient when placed in contact with the nutrient, said article having a metal-ion sequestering agent such that when said article is placed in contact with said liquid  
20 nutrient said metal-ion sequestering agent inhibits the growth of microbes in said liquid nutrient.

28. An article according to claim 27 wherein said metal-ion sequestering agent is secured to said article by a support structure.

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29. An article according to claim 27 wherein said metal-ion sequestering agent is immobilized on the surface(s) of said container and has a stability constant greater than  $10^{10}$  with iron (III).

30. An article according to claim 27 wherein said sequestering agent is immobilized on the surface(s) of said container and has a high-affinity for biologically important metal-ions such as Mn, Zn, Cu and Fe.

31. An article according to claim 27 wherein said sequestering agent is immobilized on the surface(s) of said container and has a high-selectivity for biologically important metal-ions such as Mn, Zn, Cu and Fe.

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32. An article according to claim 27 wherein said sequestering agent has a high-selectivity for certain metal-ions but a low-affinity for at least one other ion.

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33. An article according to claim 32 wherein said certain metal-ions comprises Mn, Zn, Cu and Fe and said other at least one ion comprises calcium.

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34. An article according to claim 27 wherein said metal-ion sequestering agent is immobilized on the surface(s) of said container and has a stability constant greater than  $10^{20}$  with iron (III).

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35. An article according to claim 27 wherein said metal-ion sequestering agent is immobilized on the surface(s) of said container and has a stability constant greater than  $10^{30}$  with iron (III).

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36. An article according to claim 27 wherein said metal-ion sequestering agent comprises derivatized nanoparticles comprising inorganic nanoparticles having an attached metal-ion sequestrant, wherein said inorganic nanoparticles have an average particle size of less than 200 nm and the derivatized nanoparticles have a stability constant greater than  $10^{10}$  with iron (III).

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37. An article according to claim 27 wherein said metal-ion sequestering agent is immobilized in a polymeric layer, and the polymeric layer contacts the fluid contained therein.